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DESCRIPTION *of a new portable* BAROMETER, *by the Rev.* ARTHUR M'GUIRE. *Communicated by the Rev.* H. USSHER, *D. D. M. R. I. A. and F. R. S.*

THE art of meaſuring abſolute and relative acceſſible heights by the barometer has, within a few years, been brought to a very conſiderable degree of perfection, by ingenious theory, critical experiments, and improved inſtruments. Read May 1, 1786.

THIS mode of meaſurement is, in practice, of ſingular ſimplicity, and the labour of calculation, originally not very great, is almoſt annihilated by the induſtry of the ingenious.

As all accuracy in theſe meaſures depends upon the inſtrument, every attempt to diſcover any ſource of error, even without its remedy, may be of uſe, by exciting ingenious artiſts to exert their induſtry in rendering this valuable inſtrument more unexceptionable.

IT is univerſally allowed that mercury readily imbibes air when in contact with it, particularly when they are agitated together: but as from the nature of the inſtrument the contact cannot be intirely avoided, our attention ſhould be directed to leſſen the agitation as far as poſſible; and to diminiſh the quantity of air in contact when ſuch agitation cannot be intirely removed.

MOST portable barometers which I have ſeen have the reſervoir made of ſoft leather: From the pliable texture of this material, and the great elaſticity of mercury, a conſiderable degree of agitation takes place in carriage, even when the adjuſting ſcrew at bottom is forced up as far as poſſible.—Now even allowing the leather to be impervious to air, ſtill the ſmall quantity of air which remains in the caſes covering the floating gages muſt, when the inſtrument is inverted, paſs through the body of mercury in the reſervoir, and be detained by the leather in contact and perpetual agitation with the mercury.

UPON conſidering this matter, it occurred to me that it might perhaps be of uſe to make one that ſhould have the reſervoir of wood: The following conſtruction has ſucceeded beyond my expectation:

PLATE 1ſt, is a drawing of the inſtrument, or rather of what is different in this from other portable barometers.

THE upper part, which is here omitted, is contrived, as is uſual in all good inſtruments of this kind, to ſhew the column of of mercury with its convex ſurface againſt the light, through a groove cut intirely through the braſs tube; within this latter, and ſurrounding the glaſs tube, ſlides a ſmall one, carrying the vernier, and moved by tooth and pinion; the lower edge of this ſhews an accurate contact with the convex ſurface of the mercury at the time of obſervation.

Plate 2d, is a ſection of the reſervoir and other particulars.

In fig. 1ſt, RRRR is the reſervoir formed in the turning lathe, by means of an hollowing tool introduced through the hole made for the piece L, which contains the glaſs tube I.

A is a cylindrical plug of wood, which is made to aſcend or deſcend in a hollowed cylindrical ſpace, which it very nearly fills when down; this aſcent and deſcent is effected by turning the piece M, on which is cut a ſwift ſcrew working in the piece B, which piece B is ſcrewed firmly into the box; after that the plug A is introduced and fitted into its place. G is an ivory floating gage of the uſual form.

Let us now ſuppoſe the mercury introduced into the reſervoir, with the floating gage reſting upon it, its ſurface being repreſented by the dotted line. If now the ſcrew M be turned ſo as to raiſe the plug A, the mercury will deſcend into the deſerted ſpace, and the ſurface and the floating gage reſting upon it will deſcend: Thus it appears that the piece A, as raiſed or depreſſed by the ſcrew M, is the regulator of the gage at the time of making an obſervation.

Now

Now to fill the tube up to the top, and thereby render the inſtrument portable, you muſt proceed as follows:

By means of the crank, Fig. 2d, turn the ſtop-cocks C and F, (Pl. 1ſt and 2d) until the communication be open through them to the air, as marked in Pl. 2d, Fig. 1ſt, in which you muſt conceive the ſeparated pieces lowered down, and firmly ſcrewed into their places, as repreſented in Pl. 1ſt. Then the piece H, which is alſo tubular, being ſcrewed down into its place in the piece F, pour in mercury at the top T until the reſervoir be intirely filled, and continue pouring in until the mercury (having aſcended through longitudinal grooves cut for this purpoſe through the threads of the ſcrew M, parallel to its axis) appears in the piece C at S; then turn the ſtop-cock C, and all communication with the external air is cut off.

The mercury now ſtands in the tube H at the level of S; continue to pour in at T as before, and the mercury will riſe in the tube of the barometer by the preſſure of the column in H, and at length compleatly fill it; when this is effected, turn the ſtop-cock F, and, inverting the barometer, pour back what little remains in the tube H, which piece you may then, if you think proper, unſcrew.

The inſtrument thus filled, if carried in an inverted ſituation, is ſo free from agitation, that a ſmart trot on horſeback will not cauſe it to play ſo as to be heard or felt againſt the end of the tube.

Every part of the inſtrument is now ſuppoſed intirely filled for carriage; but when an obſervation is to be made, ſome of the mercury muſt be let out, that the remainder may deſcend to the ſtandard altitude; and for this purpoſe there is a hole at D, Pl. 1ſt, ſhut by the ſtop-cock E; turn this cock with the crank, and the mercury will run out until it comes to the original level; then, having turned the cock E back again, take out the pieces C and F, and regulate the gage by the plug A, as before, and the obſervation is compleated.

This barometer, like all others, ſhould be truly vertical at the time of obſervation, and as this inſtrument ſtands upright on a table reſting on its baſe, if to this three adjuſting ſcrews are attached, and a circular level on its upper ſurface, or croſs levels, the horizontal ſtate of the box is eaſily aſcertained; but if any ſuſpicion ariſe that the tube may not be at right-angles to the top of the box, then the inſtrument may be hung in the uſual manner in gimmals.

The ſtrongeſt objections that occur to me againſt the uſe of this barometer, are the trouble of carrying a ſmall phial of mercury, and the poſſibility of air mixing with the mercury each time it is poured out at the hole D, but the trouble is not worth mentioning; and as to the air, it may and ought to be expelled at every obſervation, by heating the mercury in a ladle or crucible, and the accuracy reſulting in very nice experiments will repay the trouble.

It is, perhaps, ſuperfluous to add, that theſe, like all good barometers, ſhould have the mercury boiled in the tubes.

Plate I

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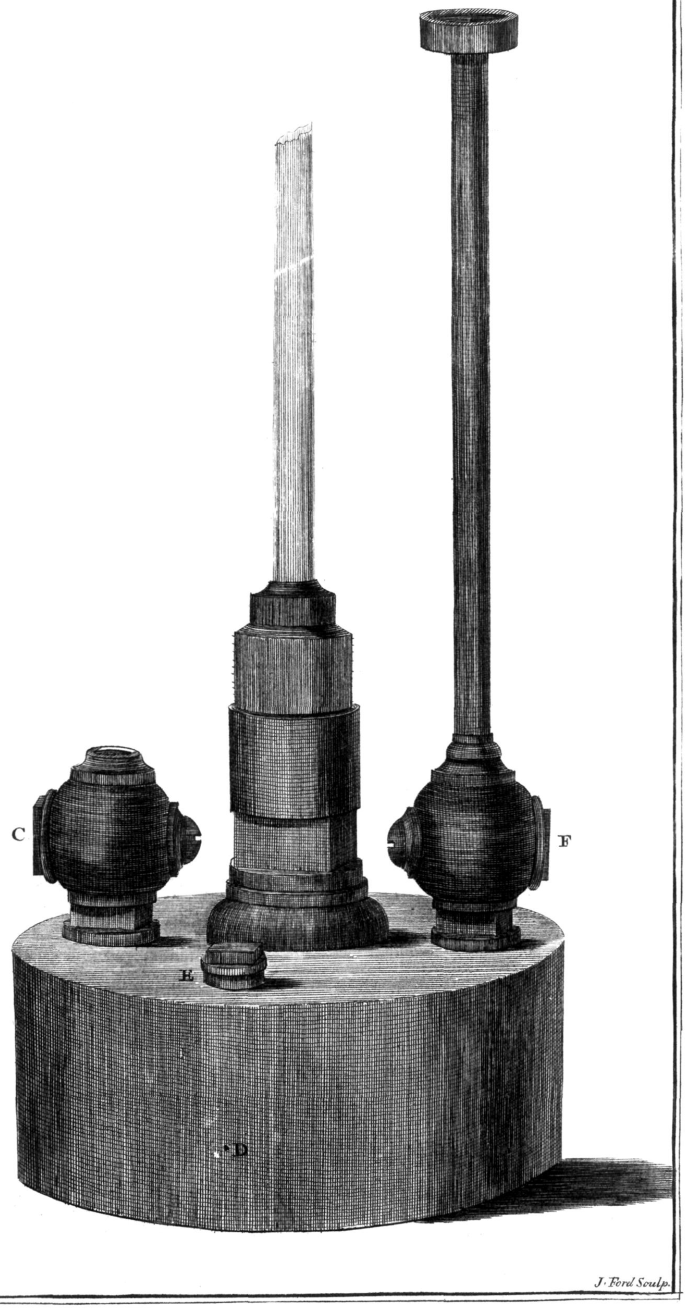

J. Ford Sculp.

Plate II

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